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EXAMINER	
HWANG, TIMOTHY	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/584,703	ONEA ET AL.
	Examiner	Art Unit
	TIMOTHY H. HWANG	2857

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 June 2006 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “camera” of claims 11, 17, and 23 and the "means for receiving the signals, using the signals to determine the speed, wheel base measurement and/or number of axles" of claims 11, 17, and 23 as well as the “database” of claims 6, 9, 17, 21, 23, 24, and 25 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 4, 5, 9, 10, 14, 16, 20, 21, 22, and 24 are objected to because they recite the language “any one of" in line 1 of each respective claim. The claims were previously in multiple dependent claim format. In their present format, each of the claims depends from only one other claim. Thus, the language “any one of" should be removed from the claim. Appropriate correction is required.

3. Claims 3, 8, 13, and 19 are objected to because the relationship between “two independent wheel base measurements" and the claims from which these dependent claims depend upon is unclear. Applicant should amend the claims to be –<u>further including</u> two independent wheel base measurements ~~are~~ determined--. Appropriate correction is required.

4. Claims 2, 3, 7, 8, 12, 14, and 18 are objected to because they are dependent claims include step or means notations, e.g., "(a)", "(b)", "(c)", which were previously used in the independent claim from which the dependent claims depend from. Such notations in the dependent claims makes the meaning of the claims unclear. Appropriate correction is required.

5. Claims 2, 4, 7, 9, 12, 15, 18, and 21 are objected to because there is insufficient antecedent basis for the terms "the first sensor" and "the second sensor" or “the first and second sensors.” Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1, 2, 3, 11, 12, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads) and Kauer et al. (US 5,020,236)**.

8. Regarding claim 1, Cohen discloses sensing a presence of the vehicle. The automatic traffic monitoring system includes a passive road sensor that accurately detects the movement of a moving vehicle (Abstract).

Furthermore, Cohen discloses recording an image of the vehicle to enable the vehicle to be identified. The traffic monitoring system 50 includes a video camera 54 (Col. 8, Lines 19-20). If the vehicle speed or the distance between two vehicles exceeds a threshold, then an image obtained from video camera 54 is analyzed to extract the license plate number of the vehicle (Col. 9, Lines 1-10).

Moreover, Cohen discloses triggering the sensors to each emit a signal. When a vehicle drives over sensors 11 and 12, a signal is recorded by processor unit 52 (Col. 8, Lines 42-46).

Additionally, Cohen discloses receiving the signals emitted by the sensors. Processor unit 52 uses the signals from sensors 11 and 12 to determine the impact times of the wheels (Col. 8, Lines 44-46).

Lastly, Cohen discloses determining the speed of the vehicle. The processor unit determines the vehicles velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

However, Cohen does not disclose determining a wheel base measurement for the vehicle.

Barbosa discloses determining a wheel base measurement for the vehicle to determine the speed profile for each individual vehicle (Page 107, Lines 9-10, Speed Profile Calculation Section). Specifically, Barbosa discloses determining the wheelbase of a vehicle by using the difference in passing times of the first and second axles over sensor 1 and sensor 2 (Page 107, Lines 5-6, Speed Profile Calculation Section). Once the wheelbase has been determined, the differences in speed profiles of vehicles may be used to analyze the influence that different traffic calming measures, i.e., speed humps, speed cushions, etc., and combinations thereof, have on traffic speed (Page 104, Lines 1-5, Introduction Section).

It would have been obvious to a person having ordinary skill in the art (PHOSITA) at the time of the Applicant's invention, to modify the method for verifying the speed of a vehicle as disclosed in Cohen, by determining a wheel base measurement for the vehicle, as disclosed in Barbosa, to determine a speed profile of a vehicle for analysis of speed deterrents.

Cohen also does not disclose that the determined wheel base measurement is compared to an actual wheel base measurement of the vehicle being sensed and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the method.

However, Kauer teaches the principle of comparing the determined wheel base measurement to an actual wheel base measurement of the vehicle being sensed and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the method for the purposes of determining if a truck is complaint with bridge law (Col. 1, Lines 7-14). Specifically, Kauer discloses that it is possible to determine the interaxle distance of a moving vehicle while its speed is being measured (Col. 1, Lines 15-18). Kauer further discloses that indirectly determining the interaxle distance of a vehicle by using the time intervals as the front and rear axle of a vehicle pass over sensors is imprecise (Col. 1, Lines 18-30).

In light of the teachings of Kauer, a PHOSITA would have come to the conclusion that indirectly determining the wheel base measurement using the speed of the vehicle as it passes over a first and second sensor would be imprecise. A PHOSITA would have also come to the conclusion that comparing the determined wheel base measurement to the actual wheel base measurement would demonstrate how accurate the measurement is (indicative of potential errors) because the determined wheel base measurement of a precise measuring system should not substantially deviate from the actual wheel base measurement.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, by comparing the determined wheel base measurement to an actual wheel base measurement, based on the teachings of Kauer, to determine the accuracy of the measuring system.

9. Regarding claim 2, Cohen discloses measuring a first time interval between the front axle triggering a signal in the first sensor and the front axle triggering a signal in the second sensor. When a vehicle travels on road 20 along traffic direction 271, its front wheels first contact sensor 11 and then sensor 12 (Col. 8, Lines 42-44). These contact times are recorded and used to determine the time difference (Col. 8, Lines 47-50).

Cohen also discloses measuring a second time interval between the rear axle triggering a signal in the first sensor and the rear axle triggering a signal in the second sensor. The system determines the precise times at which the rear wheels pass over sensors 11 and 12 (Col. 8, Lines 50-52).

Additionally, Cohen discloses computing the speed of the front axle relative to the distance separating the first and second sensors and the first time interval. The processor determines the vehicle's velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

Lastly, Cohen does not explicitly disclose computing the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval.

However, Cohen discloses that the time difference t2-t1 of the rear wheels passing over sensors 11 and 12 are used to calculate the acceleration of the vehicle. A PHOSITA would have come to the conclusion that speed of the vehicle as the rear wheel passes over sensors 11 and 12 may be computed in the same exact way as the front wheels. Any disparity between the time difference of the front wheels and rear wheels would allow a PHOSITA to compute the acceleration of the vehicle.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to compute the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval to calculate the acceleration of the vehicle.

10. Regarding claim 3, Cohen implicitly discloses measuring a third time interval between the front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor. The impact time of the front wheel contacting sensor 12 and the impact time of the rear wheel contacting sensor 11 are known (Col. 8, Lines 42-52). While Cohen focuses on the time difference of the front and rear wheels passing over sensors 11 and 12, the time between front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor is measured because the processor unit records all signals from the sensors.

Cohen does not disclose computing a first wheel base measurement for the vehicle relative to the first and third time intervals and the distance and computing a second wheel base measurement for the vehicle relative to the second and third time intervals and the distance.

However, Barbosa discloses computing a first wheel base measurement for the vehicle relative to the first time interval and the distance and computing a second wheel base measurement for the vehicle relative to the second time interval and the distance to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of verifying the speed of a vehicle as disclosed in Cohen, by computing a first and second wheel base measurement relative to a first and second time interval, as disclosed in Barbosa, to determine a speed profile for each individual vehicle being tested.

Cohen in view of Barbosa does not explicitly disclose computing a first wheel base measurement for the vehicle relative to the first *and third* time intervals and the distance and computing a second wheel base measurement for the vehicle relative to the second *and third* time intervals and the distance.

However, the third time interval approximately represents the period of time that the wheel base passes over the sensors. A PHOSITA would be able to calculate an approximate length of the wheelbase using this third time interval through algebraic manipulation. As discussed above in Cohen, the second time interval may be used to determine vehicle acceleration. It follows that because of the potential vehicle

acceleration, it is possible that this third time interval alone would not provide an accurate measurement of the wheel base. Thus, a PHOSITA would have come to the conclusion that the wheelbase should be calculated relative to the first and third time intervals as well as the second and third time intervals in order to compute a more precise wheelbase length. This would provide the advantageous benefit of removing the amount of measurement error due to vehicle acceleration.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, to compute wheel base measurements relative to the first and third time intervals and the distance, as well as the second and third time intervals and the distance, to remove the amount of measurement error due to vehicle acceleration.

11. Regarding claim 11, Cohen discloses a camera for recording an image of the vehicle to enable the vehicle to be identified. The traffic monitoring system 50 includes a video camera 54 (Col. 8, Lines 19-20).

Furthermore, Cohen discloses at least two sensors separated by a distance which are triggered to emit a signal by the front and rear axles. When a vehicle drives over sensors 11 and 12, a signal is recorded by processor unit 52 (Col. 8, Lines 42-46).

Moreover, Cohen discloses means for receiving the signals emitted by the sensors. Processor unit 52 uses the signals from sensors 11 and 12 to determine the impact times of the wheels (Col. 8, Lines 44-46).

Lastly, Cohen discloses means for using the signals to determine the speed of the vehicle. The processor unit determines the vehicles velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

However, Cohen does not disclose means for using the signals to determine a wheel base measurement for the vehicle.

Barbosa discloses means for using the signals to determine a wheel base measurement for the vehicle to determine a speed profile for each individual vehicle (Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that four estimates of the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and 2 (Speed Profile Calculation, Page 107). Once the wheelbase has been determined, the differences in speed profiles of vehicles may be used to analyze the influence that different traffic calming measures, i.e., speed humps, speed cushions, etc., and combinations thereof, have on traffic speed (Page 104, Lines 1-5, Introduction Section)

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen, by determining a wheel base measurement for the vehicle, as disclosed in Barbosa, to determine a speed profile of a vehicle for analysis of speed deterrents.

Cohen also does not disclose that the wheel base measurement determined by the system is compared to an actual wheel base measurement and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the system.

However, Kauer teaches the principle of comparing the determined wheel base measurement to an actual wheel base measurement of the vehicle being sensed and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the method for the purposes of determining if a truck is complaint with bridge law (Col. 1, Lines 7-14). Specifically, Kauer discloses that it is possible to determine the interaxle distance of a moving vehicle while its speed is being measured (Col. 1, Lines 15-18). Kauer further discloses that indirectly determining the interaxle distance of a vehicle by using the time intervals as the front and rear axle of a vehicle pass over sensors is imprecise (Col. 1, Lines 18-30).

In light of the teachings of Kauer, a PHOSITA would have come to the conclusion that indirectly determining the wheel base measurement using the speed of the vehicle as it passes over a first and second sensor would be imprecise. A PHOSITA would have also come to the conclusion that comparing the determined wheel base measurement to the actual wheel base measurement would demonstrate how accurate the measurement is (indicative of potential errors) because the determined wheel base measurement of a precise measuring system should not substantially deviate from the actual wheel base measurement.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, by comparing the determined wheel base measurement to an actual wheel base measurement, based on the teachings of Kauer, to determine the accuracy of the measuring system.

12. Regarding claim 12, Cohen discloses means for determining a first time interval between the front axle triggering a signal in the first sensor and the front axle triggering a signal in the second sensor. When a vehicle travels on road 20 along traffic direction 271, its front wheels first contact sensor 11 and then sensor 12 (Col. 8, Lines 42-44). The signal is recorded by processor unit 52 (Col. 8, Lines 44-46).

Cohen also discloses means for determining a second time interval between the rear axle triggering a signal in the first sensor and the rear axle triggering a signal in the second sensor. The system determines the precise times at which the rear wheels pass over sensors 11 and 12 (Col. 8, Lines 50-52).

Additionally, Cohen discloses means for computing the speed of the front axle relative to the distance separating the first and second sensors and the first time interval. The processor determines the vehicle's velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

Cohen does not explicitly disclose means for computing the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval.

However, Cohen discloses that the time difference t2-t1 of the rear wheels passing over sensors 11 and 12 are used to calculate the acceleration of the vehicle. A PHOSITA would have come to the conclusion that speed of the vehicle as the rear wheel passes over sensors 11 and 12 may be computed by the processing unit in the same exact way as the front wheels. Any disparity between the time difference of the

front wheels and rear wheels would allow a PHOSITA to compute the acceleration of the vehicle.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to compute the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval by the processing unit to calculate the acceleration of the vehicle.

13. Regarding claim 13, Cohen does not explicitly disclose that two independent wheel base measurements are determined for each vehicle.

However, Barbosa discloses that two independent wheel base measurements are determined for each vehicle to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that four estimates of the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107). Once the wheelbase has been determined, the differences in speed profiles of vehicles may be used to analyze the influence that different traffic calming measures, i.e., speed humps, speed cushions, etc., and combinations thereof, have on traffic speed (Page 104, Lines 1-5, Introduction Section).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system of verifying the speed of a vehicle as disclosed in Cohen, to compute two independent wheel base measurements for each vehicle, as

disclosed in Barbosa, to determine a speed profile of a vehicle for analysis of speed deterrents.

14. Regarding claim 14, Cohen implicitly discloses means for determining a third time interval between the front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor. The impact time of the front wheel contacting sensor 12 and the impact time of the rear wheel contacting sensor 11 are known (Col. 8, Lines 42-52). While Cohen focuses on the time difference of the front and rear wheels passing over sensors 11 and 12, the time between front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor is measured because the processor unit records all signals from the sensors.

Cohen does not disclose means for computing a first wheel base measurement for the vehicle relative to the first and third time intervals and the distance and means for computing a second wheel base measurement for the vehicle relative to the second and third time intervals and the distance.

However, Barbosa discloses means for computing a first wheel base measurement for the vehicle relative to the first time interval and the distance and means for computing a second wheel base measurement for the vehicle relative to the second time interval and the distance to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system of verifying the speed of a vehicle as disclosed in Cohen, by using means to compute a first and second wheel base measurement relative to a first and second time interval, as disclosed in Barbosa, to determine a speed profile for each individual vehicle being tested.

Cohen in view of Barbosa does not explicitly disclose means for computing a first wheel base measurement for the vehicle relative to the first *and third* time intervals and the distance and computing a second wheel base measurement for the vehicle relative to the second *and third* time intervals and the distance.

However, the third time interval approximately represents the period of time that the wheel base passes over the sensors. A PHOSITA would be able to calculate an approximate length of the wheelbase using this third time interval through algebraic manipulation. As discussed above in Cohen, the second time interval may be used to determine vehicle acceleration. It follows that because of the potential vehicle acceleration, it is possible that this third time interval alone would not provide an accurate measurement of the wheel base. Thus, a PHOSITA would have come to the conclusion that the wheelbase should be calculated, using a processor, relative to the first and third time intervals as well as the second and third time intervals in order to compute a more precise wheelbase length. This would provide the advantageous benefit of removing the amount of measurement error due to vehicle acceleration.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, to

compute wheel base measurements relative to the first and third time intervals and the distance, as well as the second and third time intervals and the distance, to remove the amount of measurement error due to vehicle acceleration.

15. **Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads) and Kauer et al. (US 5,020,236) as applied to claims 1 and 11 above respectively, and further in view of Hutchinson (US 2002/0000921)**.

16. Regarding claims 4 and 15, Cohen does not disclose counting or means for counting the signals triggered by the first and second sensors by each vehicle, wherein the number of signals triggered in each sensor is used to determine a number of axles associated with the vehicle.

However, Hutchinson discloses counting and means for counting the signals triggered by the first and second sensors by each vehicle, wherein the number of signals triggered in each sensor is used to determine a number of axles associated with the vehicle for the purposes of studying the rate of flow and individual speed of the vehicle traffic passing along a street (Paragraph [0013]). Specifically, Hutchinson discloses that two separated parallel tubes must be installed across the lanes of traffic to measure the time interval elapsed by a vehicle passing between the two tubes (Paragraph [0013]). This configuration may be used if the objective of the traffic measurement is to obtain the vehicle count and the direction of travel (Paragraph [0019]). Hutchinson further discloses that a two-axle and three axle vehicle passing

over the two tubes will cause four and six pulses to be transmitted, respectively (Paragraph [0013]).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the vehicle speed verification method of Cohen, to count the signals triggered by the sensors and to associate the signals with the number of axles for the vehicle, as disclosed in Hutchinson, for the purposes of studying the rate of flow and individual speed of the vehicle traffic passing along a street.

Cohen in view of Hutchinson do not explicitly disclose that the number of the axles determined is compared to an actual number of axles in the vehicle being sensed such that any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the method.

However, a PHOSITA would have come to the conclusion that comparing the sensed number of axles should be compared to the actual number of axles to determine if there is an error the vehicle speed measurement. Such a step is a natural extension of the teachings of Hutchinson because an inaccurate axle count would not provide an accurate traffic study.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the teachings of Cohen in view of Hutchinson, to compare the sensed number of axles to the actual number of axles and any discrepancy between the two is indicative of an error in the speed measurement because such a step is a natural extension of the teachings of Hutchinson since an inaccurate axle count would not provide an accurate traffic study.

17. **Claims 5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads) and Kauer et al. (US 5,020,236) as applied to claims 1 and 11 above respectively, and further in view of Johnson et al. (US 5,455,768).**

18. Regarding claim 5, Cohen does not disclose periodically calibrating the system by injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed.

However, Johnson teaches the principles of periodically calibrating the system by injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed to determine if the system is working properly (Col. 3, Lines 19-21). Specifically, Johnson discloses that the system is periodically checked to see if the magnetic probe is operational by applying a signal to the probe and monitoring the probe response (Col. 3, Lines 19-22). Johnson further discloses that the calibration can be accomplished by passing one or more vehicles through the sensing area at known speeds and adjusting the speeds determined by the device to match the known speeds (Col. 7, Lines 56-59). Johnson further discloses that the duration of the signal may not be in linear proportion to the speed of the passing vehicle and so it is necessary to pass several vehicles at different speeds and to process the signal obtained in order to obtain an accurate calibration (Col. 7, Lines 59-63). Johnson also discloses that the system applies a

signal to conduct a “self-check” if a predetermined period of time has elapsed to determine if the device is operating properly (Col. 8, Lines 59-64).

While Johnson does not explicitly disclose that the signal applied is a known vehicle speed, a voltage induced in the probe is representative of the speed of a vehicle passing over the sensing area (Col. 3, Line 65 - Col 4, Line 25). A PHOSITA would have come to the conclusion that the magnitude of the voltage applied to the probe may be proportional to a voltage corresponding to a known speed. This would provide the advantageous benefit of ensuring that the system is providing accurate measurements because the speed determined by the system as a result of applied signal should not substantially deviate from the expected response of the system. Any substantial deviation, similar to passing one or more vehicles through the sensing area, as described above, would be an indication that the system needs to be recalibrated.

It would have been obvious to a PHOSITA at the time of the Applicant’s invention, to periodically calibrate the system by injecting a signal and comparing a known vehicle speed to a determined vehicle speed, based on the teachings of Johnson, to ensure that the system is providing accurate measurements.

19. Regarding claim 16, Cohen does not disclose means for injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed.

However, Johnson discloses means for injecting into the system signals simulating sensor signals to determine if the system is working properly (Col. 3, Lines 19-21). Specifically, Johnson discloses that the system is periodically checked to see if

the magnetic probe is operational by applying a signal to the probe and monitoring the probe response (Col. 3, Lines 19-22).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen, to include means for injecting into the system signals simulating sensor signals, as disclosed in Johnson, to determine if the system is working properly.

Johnson does not explicitly disclose that the means for injecting simulator sensor signals inject signals *for a known vehicle speed and compares the determined vehicle speed with the known vehicle speed to calibrate the system*.

However, Johnson discloses that the calibration can be accomplished by passing one or more vehicles through the sensing area at known speeds and adjusting the speeds determined by the device to match the known speeds (Col. 7, Lines 56-59). Johnson further discloses that the duration of the signal may not be in linear proportion to the speed of the passing vehicle and so it is necessary to pass several vehicles at different speeds and to process the signal obtained in order to obtain an accurate calibration (Col. 7, Lines 59-63). Johnson also discloses that the system applies a signal to conduct a "self-check" if a predetermined period of time has elapsed to determine if the device is operating properly (Col. 8, Lines 59-64). While Johnson does not explicitly disclose that the signal applied is a known vehicle speed, a voltage induced in the probe is representative of the speed of a vehicle passing over the sensing area (Col. 3, Line 65 - Col 4, Line 25). A PHOSITA would have come to the conclusion that the magnitude of the voltage applied to the probe may be proportional to

a voltage corresponding to a known speed. This would provide the advantageous benefit of ensuring that the system is providing accurate measurements because the speed determined by the system as a result of applied signal should not substantially deviate from the expected response of the system. Any substantial deviation, similar to passing one or more vehicles through the sensing area, as described above, would be an indication that the system needs to be recalibrated.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen in view of Johnson, to calibrate the system by injecting a signal and comparing a known vehicle speed to a determined vehicle speed, based on the teachings of Johnson, to ensure that the system is providing accurate measurements.

20. **Claims 6, 7, 8, 17, 18, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), and Kauer et al. (US 5,020,236)**.

21. Regarding claim 6, Cohen discloses sensing a presence of the vehicle. The automatic traffic monitoring system includes a passive road sensor that accurately detects the movement of a moving vehicle (Abstract).

Furthermore, Cohen discloses recording an image of the vehicle to enable the vehicle to be classified. The traffic monitoring system 50 includes a video camera 54 (Col. 8, Lines 19-20). If the vehicle speed or the distance between two vehicles

exceeds a threshold, then an image obtained from video camera 54 is analyzed to extract the license plate number of the vehicle (Col. 9, Lines 1-10).

However, Cohen does not explicitly disclose recording an image of the vehicle to enables the vehicle to be classified *according to type*.

A PHOSITA would have come to the conclusion that the type of vehicle, such as a two axle or three axle vehicle could be determined from the image obtained from video camera 54. This would provide the advantageous benefit of allowing speed versus vehicle type analysis to be performed, which would allow traffic patterns to be studied.

It would have been obvious to a PHOSITA to record an image of the vehicle to enable the vehicle to be classified according to type based on the teachings of Cohen to allow traffic patterns to be studied.

Moreover, Cohen discloses triggering the sensors to emit a signal. When a vehicle drives over sensors 11 and 12, a signal is recorded by processor unit 52 (Col. 8, Lines 42-46).

Additionally, Cohen discloses receiving the signals emitted by the sensors. Processor unit 52 uses the signals from sensors 11 and 12 to determine the impact times of the wheels (Col. 8, Lines 44-46).

Lastly, Cohen discloses determining the speed of the vehicle. The processor unit determines the vehicles velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

However, Cohen does not disclose determining a wheel base measurement for the vehicle.

Barbosa discloses determining a wheel base measurement for the vehicle to determine the speed profile for each individual vehicle (Page 107, Lines 9-10, Speed Profile Calculation Section). Specifically, Barbosa discloses determining the wheelbase of a vehicle by using the difference in passing times of the first and second axles over sensor 1 and sensor 2 (Page 107, Lines 5-6, Speed Profile Calculation Section). Once the wheelbase has been determined, the differences in speed profiles of vehicles may be used to analyze the influence that different traffic calming measures, i.e., speed humps, speed cushions, etc., and combinations thereof, have on traffic speed (Page 104, Lines 1-5, Introduction Section)

It would have been obvious to a person having ordinary skill in the art (PHOSITA) at the time of the Applicant's invention, to modify the method for verifying the speed of a vehicle as disclosed in Cohen, by determining a wheel base measurement for the vehicle, as disclosed in Barbosa, to determine a speed profile of a vehicle for analysis of speed deterrents.

Cohen does not disclose providing a database containing data relating to various vehicle types associated with vehicle specifications including a validated wheel base measurement for each vehicle type and that the wheel base measurement determined by the method is compared to the validated wheel base measurement stored in the database.

However, Klashinsky discloses providing a database containing data relating to various vehicle types associated with vehicle specifications including a validated wheel base measurement for each vehicle type and that the wheel base measurement determined by the method is compared to the validated wheel base measurement stored in the database to monitor commercial vehicles (Col. 1, Lines 5-6). Specifically, Klashinsky discloses that a microcomputer is preprogrammed with site-specific software and data, such as vehicle classification data (validated wheel base measurements) (Col. 4, Lines 60-63). If the vehicle has been accurately detected, the microcomputer processes the signals from the sensors to determine axle spacings (wheel base length) and creates a vehicle record containing this information (Col. 5, Lines 61-67). This information is compared with the vehicle classification data stored in the memory of the microcomputer (Col. 5, Line 67 - Col. 6, Line 2).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of verifying the speed of a vehicle as disclosed in Cohen, by providing a database containing various vehicle types and wheel base measurements for each type, based on the teachings of Klashinsky to improve the automatic traffic monitoring system in Cohen by ensuring that vehicles of a particular type are traveling at a safe speed on the road as well as at a safe distance from the previous vehicle crossing over the sensors.

Cohen in view of Klashinsky does not explicitly disclose that any discrepancy between the measured wheel base and the validated wheel base is indicative of potential errors in the speed of the vehicle determined by the method.

However, Kauer teaches the principle of any discrepancy between the measured wheel base and the validated wheel base is indicative of potential errors in the speed of the vehicle determined by the method for the purposes of determining if a truck is complaint with bridge law (Col. 1, Lines 7-14). Specifically, Kauer discloses that it is possible to determine the interaxle distance of a moving vehicle while its speed is being measured (Col. 1, Lines 15-18). Kauer further discloses that indirectly determining the interaxle distance of a vehicle by using the time intervals as the front and rear axle of a vehicle pass over sensors is imprecise (Col. 1, Lines 18-30).

In light of the teachings of Kauer, a PHOSITA would have come to the conclusion that indirectly determining the wheel base measurement using the speed of the vehicle as it passes over a first and second sensor would be imprecise. A PHOSITA would have also come to the conclusion that comparing the determined wheel base measurement to the validated wheel base measurement would demonstrate how accurate the measurement is (indicative of potential errors) because the determined wheel base measurement of a precise measuring system should not substantially deviate from the validated wheel base measurement.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, by comparing the determined wheel base measurement to a validated wheel base measurement, based on the teachings of Kauer, to determine the accuracy of the measuring system.

22. With respect to claim 7, Cohen discloses measuring a first time interval between the front axle triggering a signal in the first sensor and the front axle triggering a signal in the second sensor. When a vehicle travels on road 20 along traffic direction 271, its front wheels first contact sensor 11 and then sensor 12 (Col. 8, Lines 42-44). These contact times are recorded and used to determine the time difference (Col. 8, Lines 47-50).

Cohen also discloses measuring a second time interval between the rear axle triggering a signal in the first sensor and the rear axle triggering a signal in the second sensor. The system determines the precise times at which the rear wheels pass over sensors 11 and 12 (Col. 8, Lines 50-52).

Additionally, Cohen discloses computing the speed of the front axle relative to the distance separating the first and second sensors and the first time interval. The processor determines the vehicle's velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

Lastly, Cohen does not explicitly disclose computing the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval.

However, Cohen discloses that the time difference t2-t1 of the rear wheels passing over sensors 11 and 12 are used to calculate the acceleration of the vehicle. A PHOSITA would have come to the conclusion that speed of the vehicle as the rear wheel passes over sensors 11 and 12 may be computed in the same exact way as the

front wheels. Any disparity between the time difference of the front wheels and rear wheels would allow a PHOSITA to compute the acceleration of the vehicle.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to compute the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval to calculate the acceleration of the vehicle.

23. Regarding claim 8, Cohen implicitly discloses measuring a third time interval between the front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor. The impact time of the front wheel contacting sensor 12 and the impact time of the rear wheel contacting sensor 11 are known (Col. 8, Lines 42-52). While Cohen focuses on the time difference of the front and rear wheels passing over sensors 11 and 12, the time between front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor is measured because the processor unit records all signals from the sensors.

Cohen does not disclose computing a first wheel base measurement for the vehicle relative to the first and third time intervals and the distance and computing a second wheel base measurement for the vehicle relative to the second and third time intervals and the distance.

However, Barbosa discloses computing a first wheel base measurement for the vehicle relative to the first time interval and the distance and computing a second wheel base measurement for the vehicle relative to the second time interval and the distance to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed

Profile Calculation, Page 107). Specifically, Barbosa discloses that the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of verifying the speed of a vehicle as disclosed in Cohen, by computing a first and second wheel base measurement relative to a first and second time interval, as disclosed in Barbosa, to determine a speed profile for each individual vehicle being tested.

Cohen in view of Barbosa does not explicitly disclose computing a first wheel base measurement for the vehicle relative to the first *and third* time intervals and the distance and computing a second wheel base measurement for the vehicle relative to the second *and third* time intervals and the distance.

However, the third time interval approximately represents the period of time that the wheel base passes over the sensors. A PHOSITA would be able to calculate an approximate length of the wheelbase using this third time interval through algebraic manipulation. As discussed above in Cohen, the second time interval may be used to determine vehicle acceleration. It follows that because of the potential vehicle acceleration, it is possible that this third time interval alone would not provide an accurate measurement of the wheel base. Thus, a PHOSITA would have come to the conclusion that the wheelbase should be calculated relative to the first and third time intervals as well as the second and third time intervals in order to compute a more

precise wheelbase length. This would provide the advantageous benefit of removing the amount of measurement error due to vehicle acceleration.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, to compute wheel base measurements relative to the first and third time intervals and the distance, as well as the second and third time intervals and the distance, to remove the amount of measurement error due to vehicle acceleration.

24. Claim 17 has been discussed above in the rejection of claim 11, except for:

a database containing data relating to various vehicle types associated with vehicle specifications including a validated wheel base measurement for each vehicle type;

wherein the wheel base measurement determined by the system is compared to the validated wheel base measurement stored in the database and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the system.

Cohen does not disclose providing a database containing data relating to various vehicle types associated with vehicle specifications including a validated wheel base measurement for each vehicle type and that the wheel base measurement determined by the method is compared to the validated wheel base measurement stored in the database.

However, Klashinsky discloses providing a database containing data relating to various vehicle types associated with vehicle specifications including a validated wheel

base measurement for each vehicle type and that the wheel base measurement determined by the method is compared to the validated wheel base measurement stored in the database to monitor commercial vehicles (Col. 1, Lines 5-6). Specifically, Klashinsky discloses that a microcomputer is preprogrammed with site-specific software and data, such as vehicle classification data (validated wheel base measurements) (Col. 4, Lines 60-63). If the vehicle has been accurately detected, the microcomputer processes the signals from the sensors to determine axle spacings (wheel base length) and creates a vehicle record containing this information (Col. 5, Lines 61-67). This information is compared with the vehicle classification data stored in the memory of the microcomputer (Col. 5, Line 67 - Col. 6, Line 2).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of verifying the speed of a vehicle as disclosed in Cohen, by providing a database containing various vehicle types and wheel base measurements for each type, based on the teachings of Klashinsky to monitor the movement of commercial vehicles.

Cohen in view of Klashinsky does not explicitly disclose that any discrepancy between the measured wheel base and the validated wheel base is indicative of potential errors in the speed of the vehicle determined by the method.

However, Kauer teaches the principle of any discrepancy between the measured wheel base and the validated wheel base is indicative of potential errors in the speed of the vehicle determined by the method for the purposes of determining if a truck is complaint with bridge law (Col. 1, Lines 7-14). Specifically, Kauer discloses that it is

possible to determine the interaxle distance of a moving vehicle while its speed is being measured (Col. 1, Lines 15-18). Kauer further discloses that indirectly determining the interaxle distance of a vehicle by using the time intervals as the front and rear axle of a vehicle pass over sensors is imprecise (Col. 1, Lines 18-30).

In light of the teachings of Kauer, a PHOSITA would have come to the conclusion that indirectly determining the wheel base measurement using the speed of the vehicle as it passes over a first and second sensor would be imprecise. A PHOSITA would have also come to the conclusion that comparing the determined wheel base measurement to the validated wheel base measurement would demonstrate how accurate the measurement is (indicative of potential errors) because the determined wheel base measurement of a precise measuring system should not substantially deviate from the validated wheel base measurement.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, by comparing the determined wheel base measurement to a validated wheel base measurement, based on the teachings of Kauer, to determine the accuracy of the measurement.

25. Regarding claim 18, Cohen discloses means for determining a first time interval between the front axle triggering a signal in the first sensor and the front axle triggering a signal in the second sensor. When a vehicle travels on road 20 along traffic direction 271, its front wheels first contact sensor 11 and then sensor 12 (Col. 8, Lines 42-44). The signal is recorded by processor unit 52 (Col. 8, Lines 44-46).

Cohen also discloses means for determining a second time interval between the rear axle triggering a signal in the first sensor and the rear axle triggering a signal in the second sensor. The system determines the precise times at which the rear wheels pass over sensors 11 and 12 (Col. 8, Lines 50-52).

Additionally, Cohen discloses means for computing the speed of the front axle relative to the distance separating the first and second sensors and the first time interval. The processor determines the vehicle's velocity by dividing the known distance between sensors 11 and 12 by the time difference t2-t1 (Col. 8, Lines 47-50).

Cohen does not explicitly disclose means for computing the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval.

However, Cohen discloses that the time difference t2-t1 of the rear wheels passing over sensors 11 and 12 are used to calculate the acceleration of the vehicle. A PHOSITA would have come to the conclusion that speed of the vehicle as the rear wheel passes over sensors 11 and 12 may be computed by the processing unit in the same exact way as the front wheels. Any disparity between the time difference of the front wheels and rear wheels would allow a PHOSITA to compute the acceleration of the vehicle.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to compute the speed of the rear axle relative to the distance separating the first and second sensors and the second time interval by the processing unit to calculate the acceleration of the vehicle.

26. Regarding claim 19, Cohen does not explicitly disclose that two independent wheel base measurements are determined for each vehicle.

However, Barbosa discloses that two independent wheel base measurements are determined for each vehicle to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that four estimates of the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107). Once the wheelbase has been determined, the differences in speed profiles of vehicles may be used to analyze the influence that different traffic calming measures, i.e., speed humps, speed cushions, etc., and combinations thereof, have on traffic speed (Page 104, Lines 1-5, Introduction Section).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system of verifying the speed of a vehicle as disclosed in Cohen, to compute two independent wheel base measurements for each vehicle, as disclosed in Barbosa, to determine a speed profile of a vehicle for analysis of speed deterrents.

27. Regarding claim 20, Cohen implicitly discloses means for determining a third time interval between the front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor. The impact time of the front wheel contacting sensor 12 and the impact time of the rear wheel contacting sensor 11 are known (Col. 8, Lines 42-52). While Cohen focuses on the time difference of the front and rear

wheels passing over sensors 11 and 12, the time between front axle triggering a signal in the second sensor and the rear axle triggering a signal in the first sensor is measured because the processor unit records all signals from the sensors.

Cohen does not disclose means for computing a first wheel base measurement for the vehicle relative to the first and third time intervals and the distance and means for computing a second wheel base measurement for the vehicle relative to the second and third time intervals and the distance.

However, Barbosa discloses means for computing a first wheel base measurement for the vehicle relative to the first time interval and the distance and means for computing a second wheel base measurement for the vehicle relative to the second time interval and the distance to determine a speed profile for each individual vehicle being tested (Section 3.3 Speed Profile Calculation, Page 107). Specifically, Barbosa discloses that the length of the wheelbase can be obtained using the difference between passing times of the first and second axles over sensor 1 and sensor 2 (Section 3.3 Speed Profile Calculation, Page 107).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system of verifying the speed of a vehicle as disclosed in Cohen, by using means to compute a first and second wheel base measurement relative to a first and second time interval, as disclosed in Barbosa, to determine a speed profile for each individual vehicle being tested.

Cohen in view of Barbosa does not explicitly disclose means for computing a first wheel base measurement for the vehicle relative to the first *and third* time intervals and

the distance and computing a second wheel base measurement for the vehicle relative to the second *and third* time intervals and the distance.

However, the third time interval approximately represents the period of time that the wheel base passes over the sensors. A PHOSITA would be able to calculate an approximate length of the wheelbase using this third time interval through algebraic manipulation. As discussed above in Cohen, the second time interval may be used to determine vehicle acceleration. It follows that because of the potential vehicle acceleration, it is possible that this third time interval alone would not provide an accurate measurement of the wheel base. Thus, a PHOSITA would have come to the conclusion that the wheelbase should be calculated, using a processor, relative to the first and third time intervals as well as the second and third time intervals in order to compute a more precise wheelbase length. This would provide the advantageous benefit of removing the amount of measurement error due to vehicle acceleration.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, to compute wheel base measurements relative to the first and third time intervals and the distance, as well as the second and third time intervals and the distance, to remove the amount of measurement error due to vehicle acceleration.

28. **Claims 9 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), and Kauer et al. (US 5,020,236) as applied to claims 6 and 17 above respectively, and further in view of Hutchinson (US 2002/0000921).**

29. Regarding claims 9 and 21, Cohen does not disclose counting the signals or means for counting the signals triggered by the first and second sensors by each vehicle, wherein the number of signals triggered in each sensor is used to determine a number of axles associated with the vehicle.

However, Hutchinson discloses counting the signals and means for counting the signals triggered by the first and second sensors by each vehicle, wherein the number of signals triggered in each sensor is used to determine a number of axles associated with the vehicle for the purposes of studying the rate of flow and individual speed of the vehicle traffic passing along a street (Paragraph [0013]). Specifically, Hutchinson discloses that two separated parallel tubes must be installed across the lanes of traffic to measure the time interval elapsed by a vehicle passing between the two tubes (Paragraph [0013]). This configuration may be used if the objective of the traffic measurement is to obtain the vehicle count and the direction of travel (Paragraph [0019]). Hutchinson further discloses that a two-axle and three axle vehicle passing over the two tubes will cause four and six pulses to be transmitted, respectively (Paragraph [0013]).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the vehicle speed verification method of Cohen, to count the signals triggered by the sensors and to associate the signals with the number of axles for the vehicle, as disclosed in Hutchinson, for the purposes of studying the rate of flow and individual speed of the vehicle traffic passing along a street.

Cohen in view of Hutchinson do not explicitly disclose that the number of the axles determined is compared to a validated number of axles stored in the database for the detected vehicle type such that any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the method.

However, a PHOSITA would have come to the conclusion that comparing the sensed number of axles should be compared to the validated number of axles to determine if there is an error the vehicle speed measurement. Such a step is a natural extension of the teachings of Hutchinson because an inaccurate axle count would not provide an accurate traffic study.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the teachings of Cohen in view of Hutchinson, to compare the sensed number of axles to the actual number of axles and any discrepancy between the two is indicative of an error in the speed measurement because such a step is a natural extension of the teachings of Hutchinson since an inaccurate axle count would not provide an accurate traffic study.

30. **Claims 10 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), and Kauer et al. (US 5,020,236) as applied to claims 6 and 17 above respectively, and further in view of Johnson et al. (US 5,455,768).**

31. Regarding claim 10, Cohen does not disclose periodically calibrating the system by injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed.

However, Johnson teaches the principles of periodically calibrating the system by injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed to determine if the system is working properly (Col. 3, Lines 19-21). Specifically, Johnson discloses that the system is periodically checked to see if the magnetic probe is operational by applying a signal to the probe and monitoring the probe response (Col. 3, Lines 19-22). Johnson further discloses that the calibration can be accomplished by passing one or more vehicles through the sensing area at known speeds and adjusting the speeds determined by the device to match the known speeds (Col. 7, Lines 56-59). Johnson further discloses that the duration of the signal may not be in linear proportion to the speed of the passing vehicle and so it is necessary to pass several vehicles at different speeds and to process the signal obtained in order to obtain an accurate calibration (Col. 7, Lines 59-63). Johnson also discloses that the system applies a

signal to conduct a “self-check” if a predetermined period of time has elapsed to determine if the device is operating properly (Col. 8, Lines 59-64).

While Johnson does not explicitly disclose that the signal applied is a known vehicle speed, a voltage induced in the probe is representative of the speed of a vehicle passing over the sensing area (Col. 3, Line 65 - Col 4, Line 25). A PHOSITA would have come to the conclusion that the magnitude of the voltage applied to the probe may be proportional to a voltage corresponding to a known speed. This would provide the advantageous benefit of ensuring that the system is providing accurate measurements because the speed determined by the system as a result of applied signal should not substantially deviate from the expected response of the system. Any substantial deviation, similar to passing one or more vehicles through the sensing area, as described above, would be an indication that the system needs to be recalibrated.

It would have been obvious to a PHOSITA at the time of the Applicant’s invention, to periodically calibrate the system by injecting a signal and comparing a known vehicle speed to a determined vehicle speed, based on the teachings of Johnson, to ensure that the system is providing accurate measurements.

32. Regarding claim 22, Cohen does not disclose means for injecting into the system signals simulating sensor signals for a known vehicle speed and comparing the determined vehicle speed with the known vehicle speed.

However, Johnson discloses means for injecting into the system signals simulating sensor signals to determine if the system is working properly (Col. 3, Lines 19-21). Specifically, Johnson discloses that the system is periodically checked to see if

the magnetic probe is operational by applying a signal to the probe and monitoring the probe response (Col. 3, Lines 19-22).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen, to include means for injecting into the system signals simulating sensor signals, as disclosed in Johnson, to determine if the system is working properly.

Johnson does not explicitly disclose that the means for injecting simulator sensor signals inject signals *for a known vehicle speed and compares the determined vehicle speed with the known vehicle speed to calibrate the system.*

However, Johnson discloses that the calibration can be accomplished by passing one or more vehicles through the sensing area at known speeds and adjusting the speeds determined by the device to match the known speeds (Col. 7, Lines 56-59). Johnson further discloses that the duration of the signal may not be in linear proportion to the speed of the passing vehicle and so it is necessary to pass several vehicles at different speeds and to process the signal obtained in order to obtain an accurate calibration (Col. 7, Lines 59-63). Johnson also discloses that the system applies a signal to conduct a "self-check" if a predetermined period of time has elapsed to determine if the device is operating properly (Col. 8, Lines 59-64). While Johnson does not explicitly disclose that the signal applied is a known vehicle speed, a voltage induced in the probe is representative of the speed of a vehicle passing over the sensing area (Col. 3, Line 65 - Col 4, Line 25). A PHOSITA would have come to the conclusion that the magnitude of the voltage applied to the probe may be proportional to

a voltage corresponding to a known speed. This would provide the advantageous benefit of ensuring that the system is providing accurate measurements because the speed determined by the system as a result of applied signal should not substantially deviate from the expected response of the system. Any substantial deviation, similar to passing one or more vehicles through the sensing area, as described above, would be an indication that the system needs to be recalibrated.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen in view of Johnson, to calibrate the system by injecting a signal and comparing a known vehicle speed to a determined vehicle speed, based on the teachings of Johnson, to ensure that the system is providing accurate measurements.

33. **Claims 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), and Kauer et al. (US 5,020,236), and Owen (US 2003/0011492).**

34. Claim 23 has been discussed above in the rejection of claim 17 except for:

(e) means for using the signals to determine the number of axles for the vehicle; and

(f) a database containing data relating to various vehicle types associated with vehicle specifications including a validated number of axles for each vehicle type;

wherein the axle count determined by the system is compared to the validated axle count stored in the database and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the system.

Cohen does not disclose means for using the signals to determine the number of axles for the vehicle.

However, Klashinksy discloses means for using the signals to determine the number of axles for the vehicle for the purposes of monitoring commercial vehicles (Col. 1, Lines 4-5). Specifically, Klashinsky discloses that when a vehicle passes over the sensor array, the microcomputer receives a vehicle detection signal and determines the number of axles for the vehicle (Col. 5, Lines 57-65).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen by including means to determine the number of axles of the vehicle, as disclosed in Klashinsky, for the purposes of monitoring commercial vehicles.

Cohen does not disclose a database containing data relating to various vehicle types associated with vehicle specifications including a validated number of axles for each vehicle type.

However, Klashinksy discloses a database containing data relating to various vehicle types associated with vehicle specifications including a validated number of axles for each vehicle type for the purposes of monitoring commercial vehicles (Col. 1, Lines 4-5). Specifically, Klashinsky discloses that a microcomputer is preprogrammed with site-specific software and data, such as vehicle classification data (validated

number of axles) (Col. 4, Lines 60-63). If the vehicle has been accurately detected, the microcomputer processes the signals from the sensors to determine the number of axles and creates a vehicle record containing this information (Col. 5, Lines 61-67). This information is compared with the vehicle classification data stored in the memory of the microcomputer (Col. 5, Line 67 - Col. 6, Line 2).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system for verifying the speed of a vehicle as disclosed in Cohen, by providing a database containing various vehicle types and validated number of axles for each type, based on the teachings of Klashinsky to monitor the movement of commercial vehicles.

Cohen does not disclose that the axle count determined by the system is compared to the validated axle count stored in the database and any discrepancy between them is indicative of potential errors in the speed of the vehicle determined by the system.

However, Owen teaches this principle. Specifically, Owen teaches that based on the vehicle classification, the speed of a vehicle may be determined (Paragraph [0041]). As seen in figure 3, the vehicle classification may be based on the number of axles of the vehicle (Paragraph [0038]).

In light of the teachings of Owen, a PHOSITA would have come to the conclusion that if a vehicle is improperly classified, then the determined speed of the vehicle may not be accurate because the speed calculation in Owen and vehicle classification are directly related to each other.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the system of Cohen, to compare the measured axle count to the validated axle count and any discrepancy of the two would indicate potential error in the speed determination of the vehicle, based on the teachings of Owen, to ensure that the system is providing an accurate measurement.

35. **Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), and Kauer et al. (US 5,020,236) as applied to claim 17 above, and further in view of Owen et al. (US 2003/0011492)**.

36. Regarding claim 24, Cohen does not disclose that database includes an expert system whereby axle counts and/or wheelbase measurements for vehicle types are learned from measurements made by the system and then added to the database.

However, Owen discloses a database that includes an expert system whereby axle counts for vehicle types are learned from measurements made by the system and then added to the database to classify vehicles to accurately calculate vehicle velocities (Paragraph [0016]). Specifically, Owen discloses that the vehicles may be classified into groups such as passenger vehicles, two-axle trucks, three-axle vehicles, etc. (Paragraph [0018]). Owen further discloses that a digital signal processing technique may be trained to classify events by recalling a boundary of the classification group (Paragraph [0019]).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the database of Cohen in view of Klashinsky to include an expert system to learn axle counts from measurements and to add the counts to the database, as taught by Owen, in order to accurately calculate vehicle velocities.

37. **Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen et al. (US 6,075,466) in view of Barbosa et al. (A Model of Speed Profiles for Traffic Calmed Roads), Klashinsky et al. (US 5,617,086), Harvey (Vehicle Speed Measurement Using an Imaging Method) and Kauer et al. (US 5,020,236)**.

38. Claim 25 has been discussed above in the rejection of claim 6 except for:

(h) comparing the wheel base measurement determined by the system to the validated wheel base measurement; and

(i) maintaining a register of speed and wheel base measurement data and discrepancies from validated wheel base measurement data;

wherein analysis of any discrepancies between the determined wheel base measurement data and the validated wheel base measurement data is used to determine error trends and enable system calibration.

Cohen does not disclose comparing the wheel base measurement determined by the system to the validated wheel base measurement.

However, Klashinsky discloses comparing the wheel base measurement determined by the system to the validated wheel base measurement for the purposes of monitoring commercial vehicles. Specifically, Klashinsky discloses that a microcomputer is preprogrammed with site-specific software and data, such as vehicle

classification data (validated wheel base measurements) (Col. 4, Lines 60-63). If the vehicle has been accurately detected, the microcomputer processes the signals from the sensors to determine axle spacings (wheel base length) and creates a vehicle record containing this information (Col. 5, Lines 61-67). This information is compared with the vehicle classification data stored in the memory of the microcomputer (Col. 5, Line 67 - Col. 6, Line 2).

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of calibrating a vehicle speed determination of Cohen, by comparing the wheel base measurement determined by the system to the validated wheel base measurement, as taught by Klashinsky, for the purposes of monitoring commercial vehicles.

Cohen does not disclose maintaining a register of speed and wheel base measurement data and discrepancies from validated wheel base measurement data.

However, Harvey discloses that all speed calculations are done offline (Real Time Operation Section, Page 1731). The validated wheel base measurement is known (Conclusion, Page 1733). A wheel base length and speed may be determined from the images obtained (Vehicle Speed Calcuation, Page 1731). A PHOSITA would have come to the conclusion that the results of the vehicle speed calculation could be stored, i.e., maintaining a register of measurements and discrepancies. This would provide the advantageous benefit of allowing a PHOSITA to calibrate the system based on experimental data in order to improve the accuracy of the measurement.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the method of calibrating a vehicle speed determination of Cohen, by maintaining a register of speed and wheel base measurement data and discrepancies from validated wheel base measurement data, based on the teachings of Harvey, to calibrate the system base on experimental data in order to improve the accuracy of the measurement.

Cohen does not disclose that analysis of any discrepancies between the determined wheel base measurement data and the validated wheel base measurement data is used to determine error trends and enable system calibration.

However, Kauer teaches comparing the determined wheel base measurement to a validated wheel base measurement of the vehicle being sensed and any discrepancy between them is used to determine error trends and enable system calibration for the purposes of determining if a truck is complaint with bridge law (Col. 1, Lines 7-14). Specifically, Kauer discloses that it is possible to determine the interaxle distance of a moving vehicle while its speed is being measured (Col. 1, Lines 15-18). Kauer further discloses that indirectly determining the interaxle distance of a vehicle by using the time intervals as the front and rear axle of a vehicle pass over sensors is imprecise (Col. 1, Lines 18-30).

In light of the teachings of Kauer, a PHOSITA would have come to the conclusion that indirectly determining the wheel base measurement using the speed of the vehicle as it passes over a first and second sensor would be imprecise. A PHOSITA would have also come to the conclusion that comparing the determined wheel base

measurement to the validated wheel base measurement would demonstrate how accurate the measurement is because the determined wheel base measurement of a precise measuring system should not substantially deviate from the validated wheel base measurement. Any substantial deviation would indicate that the system is not accurate and needs to be recalibrated.

It would have been obvious to a PHOSITA at the time of the Applicant's invention, to modify the wheel base measurement of Cohen in view of Barbosa, by comparing the determined wheel base measurement to a validated wheel base measurement, based on the teachings of Kauer, to determine the accuracy of the measuring system.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY H. HWANG whose telephone number is (571)270-3422. The examiner can normally be reached on 5/4/9 Monday- Friday 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/T. H. H./
Examiner, Art Unit 2857

/Jonathan C. Teixeira Moffat/
Primary Examiner AU 2857
6/14/2011